

» R4U8S «



Installation and User's Manual

SD.DT.F06-1e - September 2010

Revision History

Publication Title:		R2U4S User's Manual
Doc. ID:		SD.DT.F06-1e
Rev.	Brief Description of Changes	Date of Issue
1e	New Kontron CI	09-2010
0e	Initial version	10-2007

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Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.



Environmental protection is a high priority with Kontron.

Kontron follows the DEEE/WEEE directive.

You are encouraged to return our products for proper disposal.

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- > reduce waste arising from electrical and electronic equipment (EEE)
- > make producers of EEE responsible for the environmental impact of their products, especially when they become waste
- > encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- > improve the environmental performance of all those involved during the lifecycle of EEE

Conventions

This guide uses several types of notice: Note, Caution, ESD.



Note: this notice calls attention to important features or instructions.



Caution: this notice alert you to system damage, loss of data, or risk of personal injury.



ESD: This banner indicates an Electrostatic Sensitive Device.

All numbers are expressed in decimal, except addresses and memory or register data, which are expressed in hexadecimal. The prefix `0x` shows a hexadecimal number, following the `C` programming language convention.

The multipliers `k`, `M` and `G` have their conventional scientific and engineering meanings of $*10^3$, $*10^6$ and $*10^9$ respectively. The only exception to this is in the description of the size of memory areas, when `K`, `M` and `G` mean $*2^{10}$, $*2^{20}$ and $*2^{30}$ respectively.



When describing transfer rates, `k` `M` and `G` mean $*10^3$, $*10^6$ and $*10^9$ *not* $*2^{10}$ $*2^{20}$ and $*2^{30}$.

In PowerPC terminology, multiple bit fields are numbered from 0 to n, where 0 is the MSB and n is the LSB. PCI and CompactPCI terminology follows the more familiar convention that bit 0 is the LSB and n is the MSB.

Signal names ending with an asterisk (*) or a hash (#) denote active low signals; all other signals are active high.

Signal names follow the PICMG 2.0 R3.0 CompactPCI Specification and the PCI Local Bus 2.3 Specification.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions



Warning!

All operations on this device must be carried out by sufficiently skilled personnel only.



Caution, Electric Shock!

Before installing a not hot-swappable Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

Personal Injury

Be careful while handling the board, because of the cutting edges of the CPU heatsink.

Do not touch the CPU heatsink or the ruggedizer while removing the board from a rack because it can get very hot.

Do not place the board on any surface or in any form of storage container until the board and its heatsink have cooled down to room temperature.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.

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Chapter 1 - Introduction

The R4U8S rack, described in this document, is the 8-slot member of Kontron activities of 19-inch Rack Mount Industrial Chassis for 6U (VME64x double Eurocard bus) air-cooled boards.

The R4U8S modular design enables to fulfil the requirements of application areas ranging from the environmentally benign right through to deployed industrial, airborne and naval applications. The R4U8S racks accept all Kontron VME64x boards and any air-cooled VME64x bus boards complying with ANSI/VITA 1.1, ANSI/VITA 1.7 and ANSI/VITA 38 standards.

The R4U8S rack may be installed in a standard 19-inch rack cabinet enclosure.

The R4U8S is backed up by the full range of Kontron integration and qualification services. This ranges from the delivery of the rack equipped with boards and integration test report, to the qualification of a full managed system in compliance to the requirements of airborne or naval applications.



Figure 1: R4U8S Overview

The objective of this document is to describe the hardware environment of the R4U8S racks.

 **Functional changes that differ from previous version of the document are identified by a vertical bar in the margin.**

The chapters in this document are:

- > Chapter 1 - This chapter - Brief description of the rack.
- > Chapter 2 - Technical Characteristics: dimensions, card cage, power supply unit, environmental specifications, MTBF.
- > Chapter 3 - Preparing Before Using: ESD recommendations, environmental protection, receipt, description and identification of the equipment.
- > Chapter 4 - Hardware Description: external and internal description, control panel, access to the internal peripherals.
- > Chapter 5 - Hardware Installation and Rack Maintenance.

» Order Code

 The front and the rear panels of the R4U8S rack depend on the manufacturing options: *Enclosure Panel Door* and *6U VME Boards Bay*; consequently they may be different from those shown in this document. The photographs and diagrams in this manual apply to specific order codes; refer to following table to decode the manufacturing options.

ORDER CODE	R4U	8S	V-	SA	7			00
		↑	↑	↑	↑	↑	↑	↑
8 slots 6U - 160 mm boards		8S						
VME64x backplane with P0 connector			V-					
Environmental Build for SA and WA boards				SA				
700W Power Supply					7			
Enclosure Panel Door	Front Only					F		
	Rear Only					R		
6U VME Boards Bay	Front						1	
	Rear						2	
Reserved								00

Table 1: Order Code

Chapter 2 - Technical Characteristics

The main characteristics of the R4U8S racks are:

Dimensions	
Height	4U 7" / 178 mm
Width	19" / 482.6 mm 17.63" / 448 mm without mounting ears
Depth	17.32" / 440 mm
Weight (approximately)	12 Kg
Card Cage	
6U VME64x	VITA 1.1 / VITA 1.7 & VITA 38 VME64x backplane with P0 connector
6U CPCI	Please contact Kontron
Slots	8 - Horizontal
Bay Position	Front or Rear
Air Cooling	1.5 m/s average airflow (0) (1)
Acoustic Noise	< 55 dB
RTM Bay	6U - 80 mm - VITA 36 compliant
Door	Yes - Front or Rear
Peripherals (2)	Up to 2 x 2.5" HDD or 2 x 3.5" HDD
Power Supply Unit (PSU)	
Input Voltage	100-240 VAC (50-60 Hz)
Power	700 W
Output Voltages and Strength	+5V 80A +3.3V 80A +12V 20A -12V 20A
Redundancy	Option
Modular PSU	Yes

Environmental Specifications		
Temperature	Operating:	DO-160E §4 -20°C to +65 °C (3)
	Storage:	-40°C to +85 °C
Relative Humidity		DO-160E §6 5 to 95% non condensing
Flammability		UL94-V0
Safety		EN60950
EMC - Emissions (4)		
	Conducted/Radiated	EN55022 Class A (5)
	Harmonic Distorsion	EN61000 §3.2
	Flicker and Fluctuation	EN61000 §3.3
EMC - Immunity (4)		
	Conducted/Radiated Susceptibility	EN55024
	Electrostatic Discharge	EN61000 §4.2
	Radiated RFI	EN61000 §4.3
	Fast Transients - burst	EN61000 §4.4
	Input Line Surges	EN61000 §4.5
	Conducted RFI	EN61000 §4.6
	Voltage Dips	EN61000 §4.11
Altitude	Operating:	10,000 ft (3,048 m)
	Storage:	30,000 ft (9,144 m)
Shock	Operating:	DO-160E 15 g peak half sinus 11 ms duration
	Storage:	15 g peak half sinus 20 ms duration
Vibration	Operating:	DO-160E §8.5.2 Curve B (1.48 G _{rms}) from 10 to 2000 Hz
	Operating:	EN60068 2 g sinusoidal from 5 to 500 Hz
MTBF		
Ground Benign (GB)		MIL-HDBK-217F 25°C 102,000 hours

Table 2: Main Characteristics



- (0) The ventilation direction of the rack is defined as follows:
- Air input is on the fans side and air output on the opposite side.

The ventilation direction of the rack depends on the *6U VME Boards Bay* Manufacturing option.

- *6U VME Boards Bay: Rear*

Air input on the right (fans) side and air output on the left side of the rack.

- *6U VME Boards Bay: Front*

Air input on the left (fans) side and air output on the right side of the rack (see Figure 2 below).

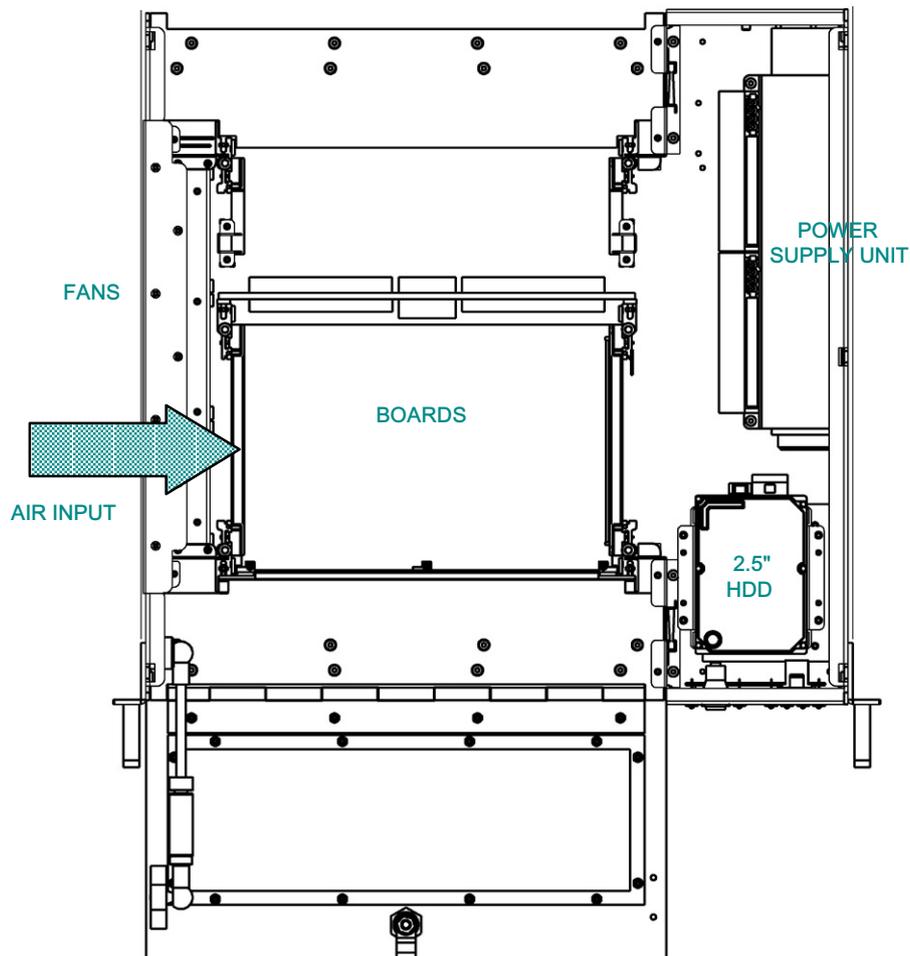


Figure 2: Ventilation Direction



- (1) When located in a cabinet, make sure to leave a free space, around 4 cm, on the left and right sides of the rack.

 (2) Please contact your Kontron representative for detailed information on specific peripherals support (e.g. DVD-ROM drive) .

 (3) The maximum room temperature is 45°C. Continued operation at this temperature may degrade hardware performance. It is advisable, therefore, to install a supplementary air conditioning system in the room if temperature of the site is greater than that recommended.

 (4) The front panels of the Kontron boards are equipped with an EMC gasket. To preserve the gaskets and to prevent that the components of the boards could be damaged by contact with gaskets, it is mandatory:

- When the boards are horizontal, insert them downward. To unplug the boards proceed in the inverse sense of the insertion.

 (5) This material is a class A material. In a residential environment, this material can cause radio electric scramblings. In that case, the user may be asked to take suitable measures.

2.1 Technical Recommendations



Recommendation

Avoid connecting your rack on the same circuit as any electrical equipment that does not have a noise suppressor, and can produce transient phenomena.

It is preferable to install a separate power line directly from the main electrical network.

All the system components (peripheral rack, printer, etc.) must be connected directly to the main electrical network.



Power Supply

Check the correct input voltage prior applying power to the unit. Refer to Table 2 "Main Characteristics", section "Power Supply Unit PSU".



Electrical safety

To prevent electrical accidents that could damage your equipment and threaten user safety, adhere to the regulations and standards recommended in the IEC publication 364 (International Electronic Commission) and the French standard NFC 15-100.



Electrical Damage

Avoid connecting cables to the front panel application connectors while functioning. Voltage discharge may damage the inserted boards I/O devices or the power supply.



Fire safety

Fire extinguishers, type CO₂, should be installed in the work area, close to the rack.



User Safety

All fans are externally protected with proper finger guard grids. User should avoid touching any fan part with his fingers.



DO NOT turn the power on while the power is cycling off. Wait a few seconds until the power has completely cycled off. Follow the same precaution for turning the power off.

Turning the power on or off before this cycle is complete can cause the voltage and temperature values programmed into the board monitoring system to be lost.

MAKE SURE YOU FOLLOW THESE SAFETY PRECAUTIONS.



Make sure the rack has been powered off using the ON/OFF button (on the front control panel of the rack) before unplugging the power supply cable.



It is strongly recommended to use an antistatic wrist strap and a conductive foam pad when you install or upgrade your system to prevent the accumulation of electrostatic charges.



Avoid touching areas of integrated circuitry; static discharge can damage circuits.

Chapter 3 - Preparing Before Using

3.1 Receipt of the Equipment

3.1.1 Checking the Packages

Inspecting the packages and verifying their condition is the responsibility of the customer and should be carried out upon delivery.

- > Inspect the cartons and check their condition:
 - ▶ no broken corners,
 - ▶ general state of the case (no rips or holes),
 - ▶ condition of the bands and the clips.
- > If you wish to report any damage in transit, you should make out a full report, and also note the damage on the packing list that accompanies the equipment. Ensure that the report and the packing list are signed by yourself and also by the transport agent, and send a copy of these documents to:
 - ▶ the transport company,
 - ▶ Kontron.

3.1.2 Unpacking

Unpacking the equipment must be carried out under the supervision of a technician approved by Kontron.

- > Open each of the packages and take out the items one by one.



Two people should assist in the unpacking of the system unit and the monitor, as these items may be heavy.

- > Inspect each item and make a note of any possible defects (scratches, marks or blemishes on the monitor screen, damaged cables, etc.). If necessary, make a report of any damage or defects.
- > Check the equipment against the packing list and report any missing items.



It is recommended that you keep the cartons and the anti-shock protection. This will be required if you decide to move your system or rack to a different site.



The rack is delivered inside a protective film. Make sure to remove this protective film before starting the system; otherwise that could damage the system.

3.2 Description of the Equipment

- The standard equipment delivered is:
 - ▶ the rack,
 - ▶ the Kontron documentation CD-ROM,
 - ▶ the power supply connection kit.

- The equipment may also include optional units, if they are ordered, such as:
 - ▶ Kontron SBC or Computing Node (i.e. PowerEngine7, PENTXM2, PowerNode3, ...),
 - ▶ The cables required for the I/O of the Kontron boards,
 - ▶ Graphics monitor or VT100 console,
 - ▶ Keyboard, mouse or track ball,
 - ▶ Kontron PMCs (see CD-ROM documentation),
 - ▶ Other PMCs (see associated documentation),
 - ▶ RTM (Rear Transition Modules) for expanding I/O on P0 and P2 and associated cables,
 - ▶ Internal HDD (Hardware Device Disk),
 - ▶ External disk, 4 mm tape or CD-ROM drive,
 - ▶ ...

3.3 Identification

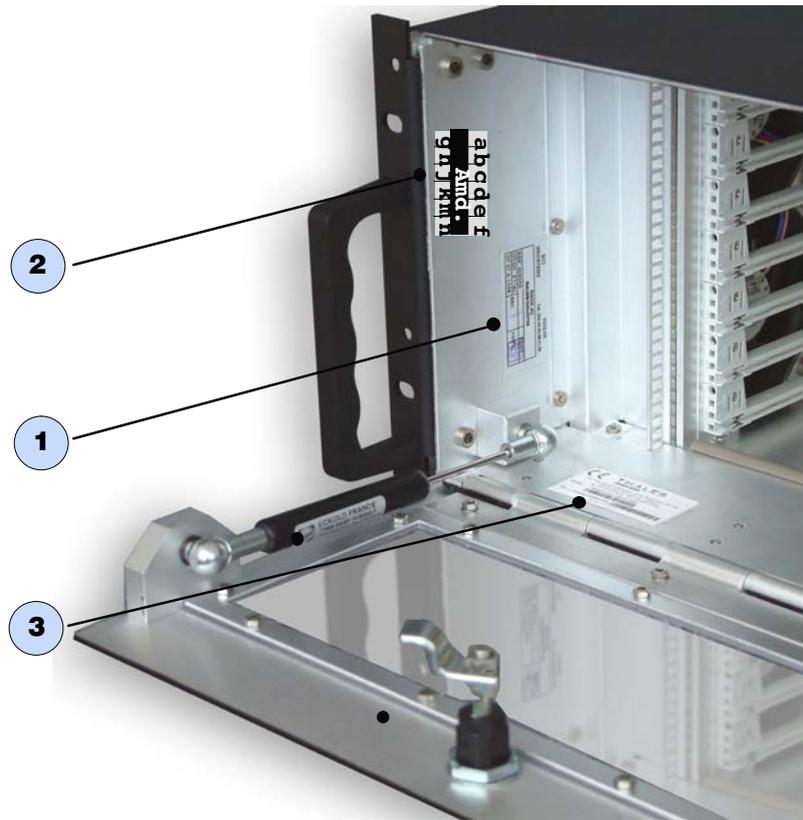


Figure 3: Identification

The rack is identified by three labels:

- ▶ Two of them are located inside the rack, near the EMC door (refer to Figure 3 above).

1 "Manufacturer Label": manufacturer information and rack identification.

2 "Amendment Label": the last notched letter indicates the revision level of the rack.

- Revision a in the opposite exemple.

- If the "Amendment Label" is not available; the rack is delivered in its initial revision.

X	b	c	d	e	f
Amd .					
g	h	j	k	m	n

- ▶ The third one, is located inside the rack, near the the EMC door (refer to Figure 3 above).

3 "System Label": Model and Serial Number of the rack



Chapter 4 - Hardware Description

4.1 External Description

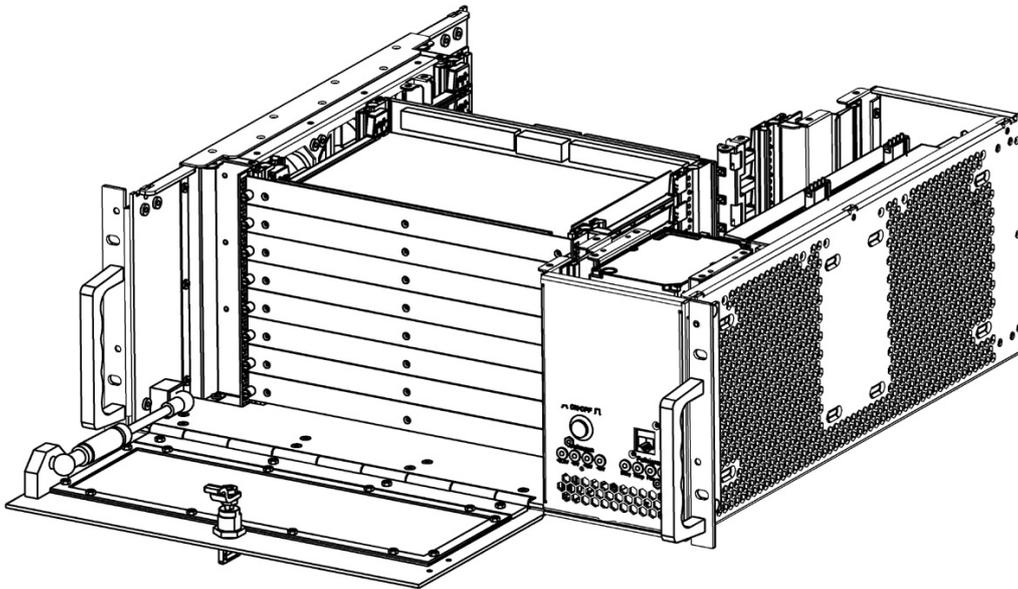


Figure 4: Front View

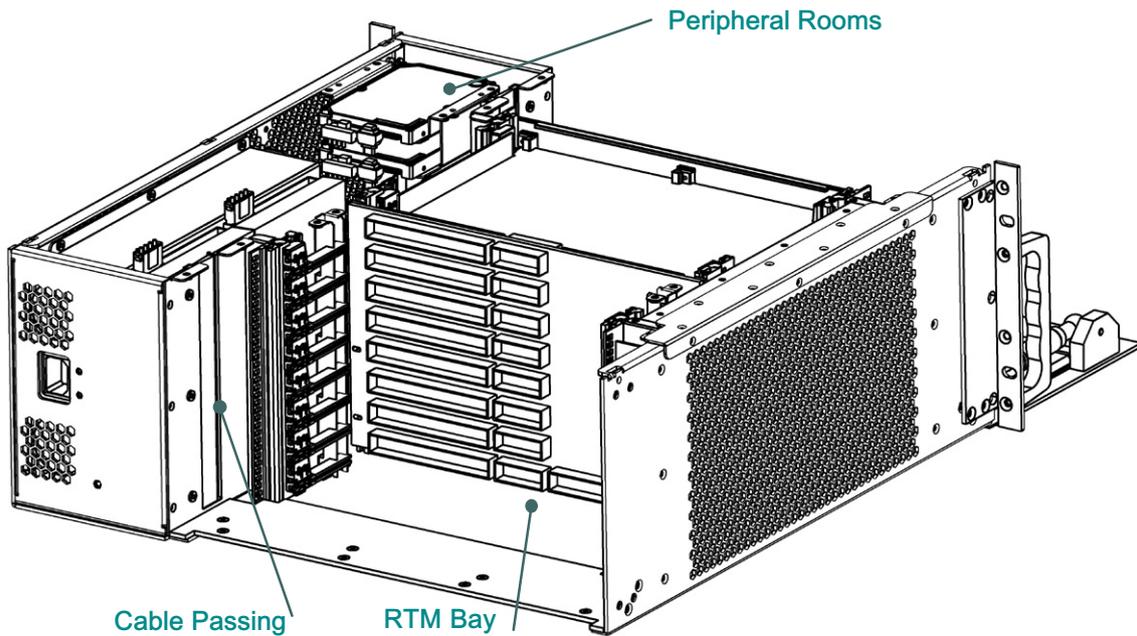


Figure 5: Rear View



A cabling way eases cable passing between the front and rear cards bays and/or between one of these bays and the peripherals rooms

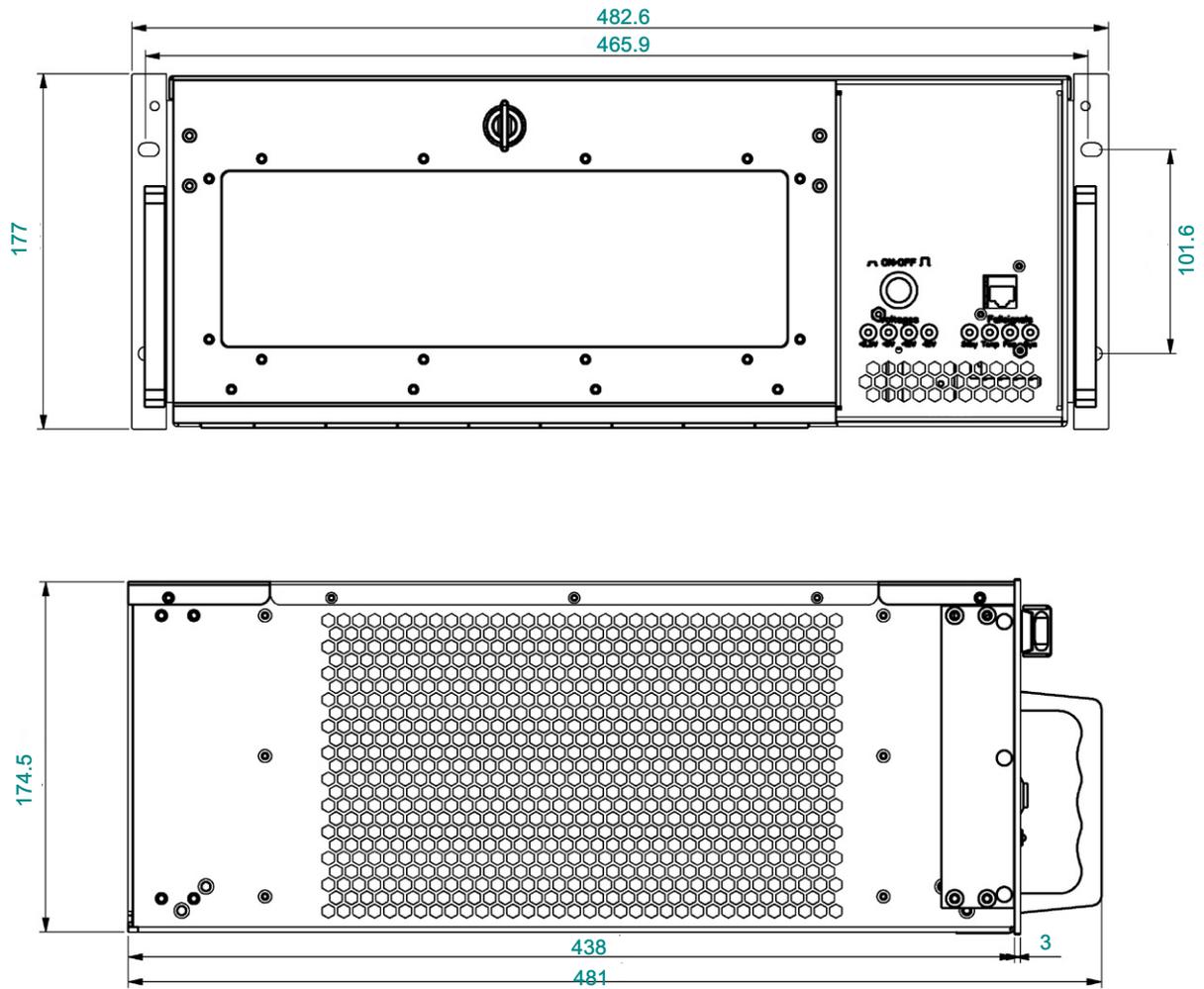


Figure 7: Overall Dimensions (Side Views)

4.3 Control Panel

4.3.1 Front Control Panel

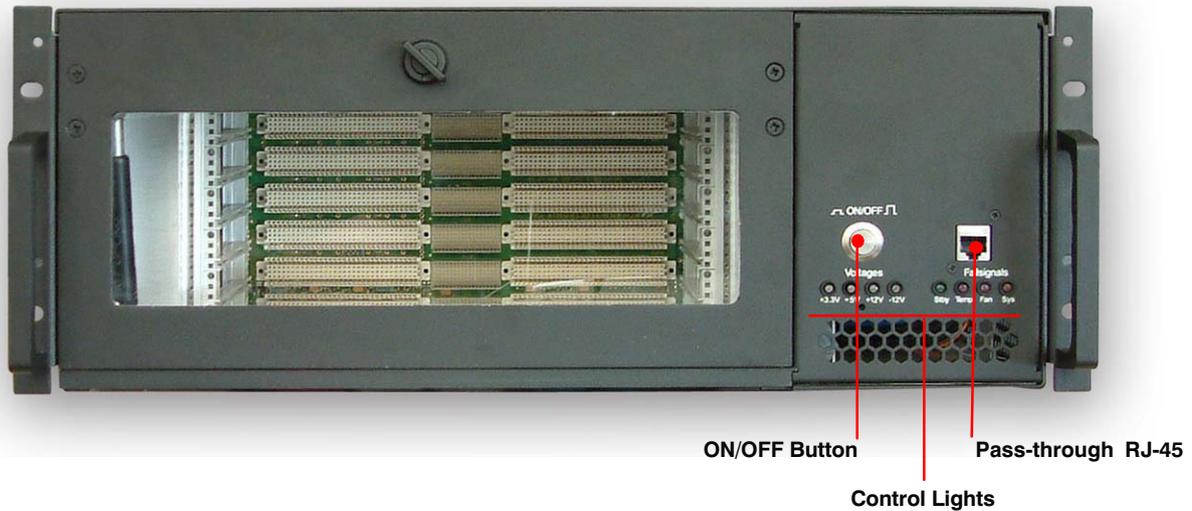


Figure 8: Front Control Panel



Depending on the *6U VME Boards Bay* Manufacturing option, the front control panel may be located on the left side or on the right side of the front panel:

- *6U VME Boards Bay: Front* the front control panel is located on the right side of the front panel (refer to Figure 8).
- *6U VME Boards Bay: Rear* the front control panel is located on the left side of the front panel.

4.3.1.1 ON/OFF Button

The ON/OFF button is located on the front panel of the R4U8S rack.



DO NOT turn the power on while the power is cycling off. Wait a few seconds until the power has completely cycled off. Follow the same precaution for turning the power off.

Turning the power on or off before this cycle is complete can cause the voltage and temperature values programmed into the board monitoring system to be lost.

MAKE SURE YOU FOLLOW THESE SAFETY PRECAUTIONS.



Make sure the rack has been powered off using the ON/OFF button (on the front control panel of the rack) before unplugging the power supply cable.

4.3.1.2 Pass-through RJ-45

A pass-through RJ-45 plug allows the customer to easily route an Ethernet link to the front control panel.

4.3.1.3 Control LEDs

The control LEDs are located on the front panel of the R4U8S rack.



Figure 9: Control LEDs

» Voltages: +3.3V, +5V, +12V, -12V

These LEDs monitor and show that the power supplied is within the permitted tolerances.

- Green light: The power is on (ON/OFF Button) and the voltages are within the permitted tolerances. Green light must remain illuminated (without flickering) when the system is powered on.

» Fail Signals: Stdby, Temp, Fan, Sys

Stdby LED: The standby LED indicates that the power supply cable is connected to the rack. The equipment is ready for use, but not necessarily in use.

- Green light: The power supply cable is connected, independently of the ON/OFF button status.

Temp LED: This LED indicates that the rack temperature is within the permitted tolerances.

- Red light: Temperature is out of the permitted tolerances.

Fan LED: This LED indicates that the fans are working correctly

- Red light: Fans are not working correctly.

Sys LED: This LED indicates that the `ACFAIL` signal is present.

- Red light: `ACFAIL` signal is present.

4.3.2 Rear Control Panel



Figure 10: Rear Control Panel



Depending on the *6U VME Boards Bay* Manufacturing option, the rear control panel may be located on the left side or on the right side of the front panel:

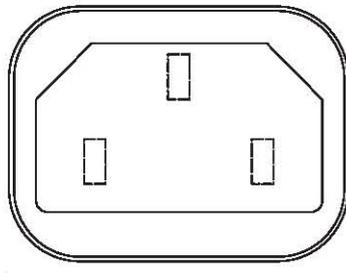
- *6U VME Boards Bay: Front* the rear control panel is located on the left side of the front panel (refer to Figure 10).
- *6U VME Boards Bay: Rear* the rear control panel is located on the right side of the front panel.

4.3.2.1 Power Supply Connector

» J1 Mating Connector

IEC320 type female plug rated 3[^]

Pin	J1
1	Line
2	Neutral
3	Earth



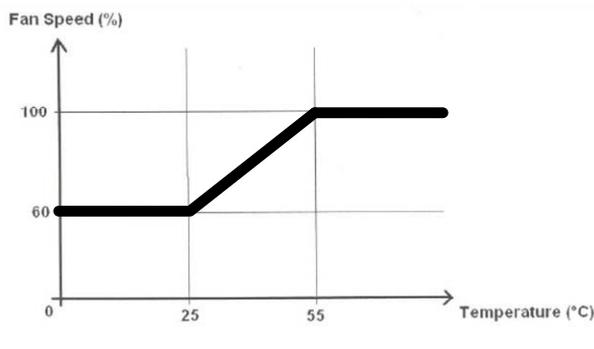
4.4 Monitoring Card

» Start Up of the Monitoring Card

At the start up of the monitoring card, a LEDs flickering test is launched with 4 one second cycles which are composed of 0.5 second of green state (+3.3V, +5V, +12V and -12V are lighted in green) and 0.5 second of red state (except Stdbby, all LEDs are lighted in red).

» Temperature and Fan Control

The temperature acquisition is made by four I2C temperature sensors. If the temperature is higher than +70°C, the Temp LED is lighted. The monitoring card controls the speed of three fans and is compliant to the following graph:



If the Monitoring card detects one speed of the three fans lower than 45% of full speed, the Fan LED is lighted and the other fans are set in full speed mode

» Failure Detection List

Failure Description	Diagnosis
Temp LED flickers	The monitoring card has detected less than 4 temperature sensors
Temp LED is ON (red) but the temperature is lower than +70°C	The monitoring card has not detected any temperature sensors at start up
Temp LED is ON (red)	The temperature is higher than +70°C
Fan LED is ON (red)	The monitoring card has detected a fan failure
One voltage indicator LED is lighted in green	The voltage level of this channel is correct
One voltage indicator LED is lighted in red	The voltage level of this channel is not correct
Voltage indicator LEDs flicker	The monitoring card has detected a failure
Sys LED is ON (red)	A VME board has detected a failure

4.5 Input/Ouput Distribution Panel

The I/O distribution panel consists of the front panel of the boards contained in the rack. These front panels are accessible via the front or the rear panel of the R4U8S rack depending on the manufacturing option: *6U VME Boards Bay*.

6U VME Boards Bay	Description
Front	The VME boards are accessible via the front panel of the rack.
Back	The VME boards are accessible via the rear panel of the rack.

Depending on the manufacturing option: *Enclosure Panel Door* the accesses to the boards or the RTM may be protected by an enclosure panel door.

	Enclosure Panel Door: Front Only	Enclosure Panel Door: Rear Only
6U VME Boards Bay: Front	<ul style="list-style-type: none"> - The VME boards are accessible via the front panel of the rack. - The front panel of the rack is closed by an enclosure panel door. 	<ul style="list-style-type: none"> - The VME boards are accessible via the front panel of the rack. - The rear panel of the rack is closed by an enclosure panel door.
6U VME Boards Bay: Back	<ul style="list-style-type: none"> - The VME boards are accessible via the rear panel of the rack. - The front panel of the rack is closed by an enclosure panel door. 	<ul style="list-style-type: none"> - The VME boards are accessible via the rear panel of the rack. -The rear panel of the rack is closed by an enclosure panel door.

4.6 Access to the Internal Peripherals



Inserting or removing modules with power applied may result in system damage.

Up to two 2.5 inch hardware disks or two 3.5 inch hardware disks may be installed inside the rack. Several configurations are available and described below:

- > Installing two 2.5" HDD on top of the monitoring card. Refer to section 4.6.1 page 19.
- > Installing two 3.5" HDD on top of the power supply unit. Refer to section 4.6.2 page 21.
- > Installing two 2.5" HDD on a specific tray (optional component). Refer to section 4.6.3 page 21.
- > Installing two 3.5" HDD on a specific tray (optional component). Refer to section 4.6.4 page 21.

Other solutions should be considered, please contact your Kontron representative.

4.6.1 Installing two 2.5" HDD on Top of the Monitoring Card

Up to two 2.5 inch hardware disks may be installed on a specific support located on top of the monitoring card. This specific support is accessible by removing the cover of the rack.

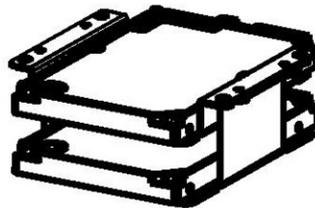


Figure 11: 2.5" HDD Support

» Assembling Procedure

1. Power-off the rack (ON/OFF button).
2. Remove the cover of the rack. Unscrew the screws by using a Pozidriv screwdriver.



If the disks are already installed on the specific support, make sure to remove the connectors between the disks and the boards and between the disks and the power supply before removing the cover of the rack.

3. While holding the specific support, unscrew the disk mounting screws from the cover of the rack.
4. Install/Uninstall the disks on the specific support. Each disk is fixed to the specific support with four screws.
5. While holding the specific support, screw the disk mounting screws removed at stage 3. to fix the specific support to the cover of the rack.
6. Plug the connectors between the disks and the boards, and between the disks and the power supply.
7. Install the cover of the rack. Fix it to the rack frame with the screws removed at stage 2.
8. Power-on the rack.

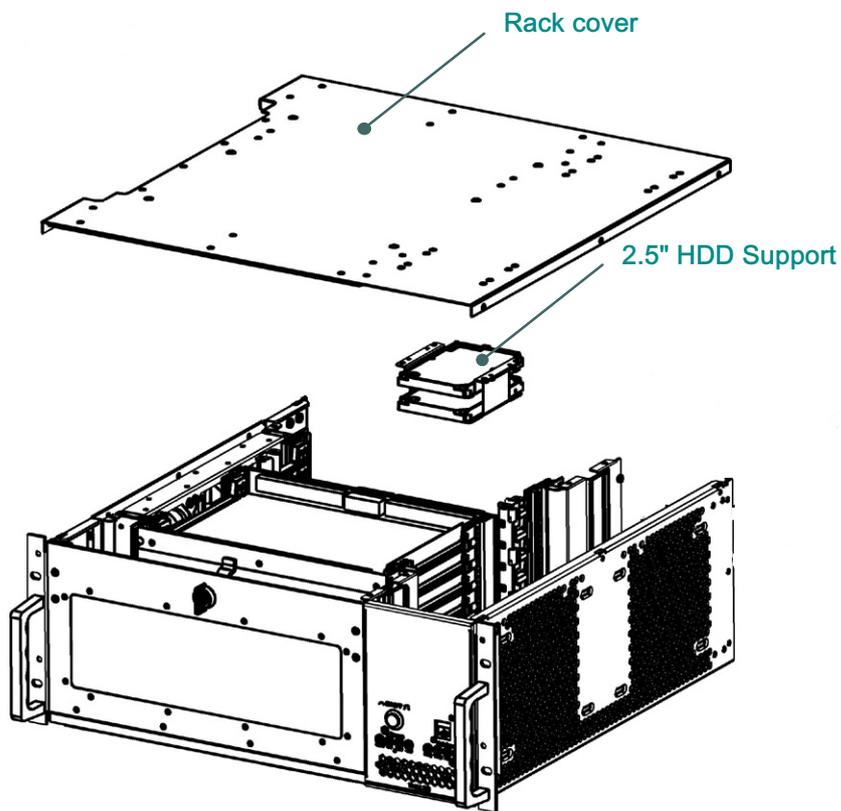


Figure 12: Splitted View

4.6.2 Installing two 3.5" HDD on Top of the Power Supply Unit

Up to two 3.5 inch hardware disks may be installed on a specific support located on top of the power supply unit. This specific support is accessible by removing the cover of the rack.

» Assembling Procedure

1. Power-off the rack (ON/OFF button).
2. Remove the cover of the rack. Unscrew the screws by using a Pozidriv screwdriver.



If the disks are installed on the specific support, make sure to remove the connectors between the disks and the boards and between the disks and the power supply before removing the cover of the rack.

3. While holding the specific support, unscrew the disk mounting screws from the cover of the rack.
4. Install/Uninstall the disks on the specific support. Each disk is fixed to the specific support with four screws.
5. While holding the specific support, screw the disk mounting screws removed at stage 3. to fix the specific support to the cover of the rack.
6. Plug the connectors between the disks and the boards, and between the disks and the power supply.
7. Install the cover of the rack. Fix it to the rack frame with the screws removed at stage 2.
8. Power-on the rack.

4.6.3 Installing two 2.5" HDD on a Specific Tray

Up to two 2.5 inch hardware disks may be installed on an optional tray. This optional tray may be inserted in a free slot of the rack, RTM bay side or the 6U VME boards side; depending on the configuration of the rack. This tray takes up one slot.

» Assembling Procedure

Contact your Kontron representative for more information on this topic.

4.6.4 Installing two 3.5" HDD on a Specific Tray

Up to two 3.5 inch hardware disks may be installed on two optional trays. Each optional tray may be inserted in a free slot of the rack, 6U VME boards side only. One disk only may be installed by tray, each tray takes up two slots.



Installing two 3.5 inch HDD, will leave only four free slots in the rack.

» Assembling Procedure

Contact your Kontron representative for more information on this topic.

Chapter 5 - Hardware Installation and Rack Maintenance

5.1 Hardware Installation Procedure

All Kontron racks are configured and tested at the factory according to the Quality procedures and instructions developed and implemented at Kontron, in accordance with the ISO 9000 standards.

The installation and the initial start-up of a Kontron rack must be performed by personnel who have appropriate training for Kontron hardware.

5.2 Rack Maintenance Procedure

When the operating conditions for the R4U8S rack, given in Chapter 2, are implemented the rack does not require any particular preventive maintenance.

Maintenance on the fixed parts of the R4U8S rack: the card tray, the VME backplane, the fans, and the power supply must be performed at the Kontron operation center or in a repair shop that specializes in this equipment.

MAILING ADDRESS

Kontron Modular Computers S.A.S.
150 rue Marcelin Berthelot - BP 244
ZI TOULON EST
83078 TOULON CEDEX - France

TELEPHONE AND E-MAIL

+33 (0) 4 98 16 34 00
sales@kontron.com
support-kom-sa@kontron.com

For further information about other Kontron products, please visit our Internet web site:
www.kontron.com.

